Date: 20th September 2021
Our Ref No.: TJ/UT1/OUT-08

To,
Doosan Heavy Industries & Construction Co., Ltd.
Mr. Youngsoo Son– Project Manager
465 Gangnam-daero, Seocho-gu, Seoul, Korea (06611)

Contract Reference: Engineering, Procurement and Construction Contract between Nepal Water And Energy Development Company Private Limited (NWEDC) and Doosan Heavy Industries & Construction Co. Ltd for the Engineering, Procurement and Construction (EPC) for the 216 MW Hydropower Plant at Upper Trishuli -1, Nepal

Subject: Submission of Review Note on Excavation and Initial Support Drawings of Investigation Tunnel for Powerhouse

References:

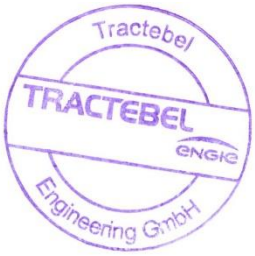
1. Document No. UT1-C-385-CVL-DC-65001 dated 19th August 2021
2. Drawing No.: UT1-C-385-CVL-DG-65001 dated 1st September 2021
3. Drawing No.: UT1-C-385-CVL-DG-65002 dated 1st September 2021

Dear Sir,

Reference is made to the above No.1, 2 and 3 received with transmittal No. UT1-HEP-DHI-D-0038 dated 1st September 2021, regarding excavation and initial support drawings of investigation tunnel for powerhouse.

Please find our comments in the Review Notes (RN-0009, RN-0010, and RN-0011) enclosed herewith this letter.

Sincerely,



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Mr. Carsten GUNTERMANN
Project Manager (CRE)

Enclosure:
1. Review Notes (RN-0009, RN-0010, and RN-0011)

UPPER TRISHULI-1 HEP (216MW)

Client	**Nepal Water and Energy Development Company Private Limited**
Owner's Engineer	**Tractebel Engineering GmbH / Jade Consult**

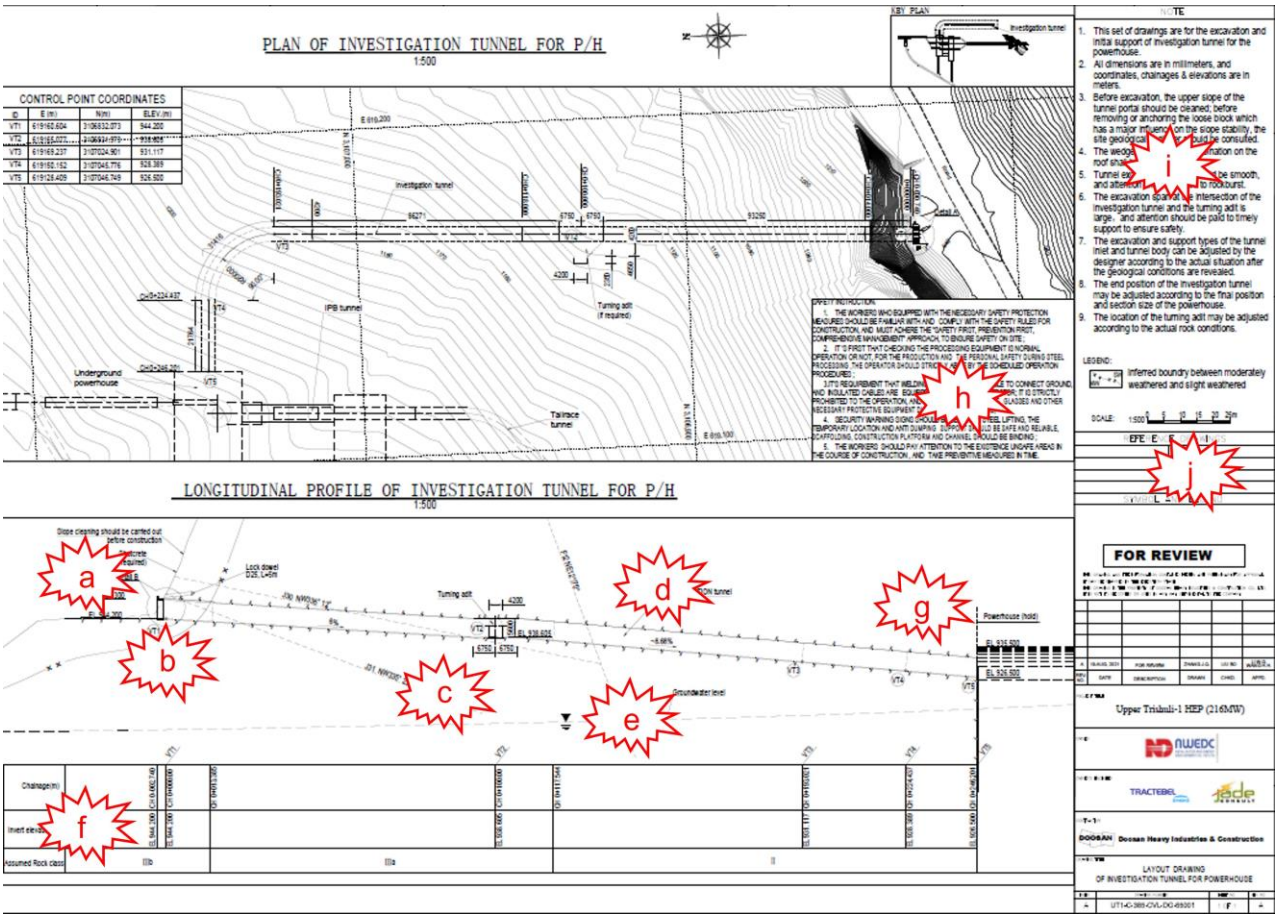
REVIEW NOTE

Contractor	**Doosan Heavy Industries & Construction Co., Ltd.**		
Title of the Document	Layout Drawing Investigation Tunnel for Powerhouse		
Document No.	UT1-C-385-CVL-DG-65001	Revision	A
Date of Documents	01.09.2021	Received Date	01.09.2021
Transmittal Form No.	UT1-HEP-DHI-D-0038		
Previous Review Date/Status	N/A	Prev. Review Note No.	N/A
Review Note No.	**RN-0010**	**Present Review Date**	**20.09.2021**
		Present Review Status	**RR**

A: Approved AC: Approved with Comments RR: Returned for Resubmission

Comments

The following comments refer to the marked drawing:



a) Support details at the portal must not be shown.
b) See Review Note on the Construction Drawings of the tunnel. There refer to the confusing chainage at the portal.
c) The turning bay does not need to be horizontal, as it is also indicated that the selected location my change. This would lead to new gradients along the tunnel and would require redesign.
d) Select one uniform gradient for the entire tunnel, wherever the turning bay will be located.
e) Geological structures must not be indicated in this drawing. A small table of major joints sets is sufficient.
f) Provide one row with “Overburden Thickness” (= rock cover thickness).
g) It is for construction reasons preferable that the tunnel enters the Powerhouse at its roof, i.e., the roof the tunnel, when entering the Powerhouse is at the same elevation as the roof of the Powerhouse. Countercheck with the current Powerhouse design and revise.
h) Safety instructions are not needed on a layout drawing. Delete. They should appear in the Method Statement for the tunnel.
i) See separate notes below.
j) Provide the reference drawings/documents in this list.

NOTE

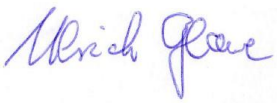
1. This set of drawings are for the excavation and initial support of investigation tunnel for the powerhouse.
2. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.
3. Before excavation, the upper slope of the tunnel portal should be cleaned; before removing or a[a] the loose block which has a major i[a]e on the slope stability, the site geological engineer should be consulted.
4. The wedges[b] joints combination on the roof shall be[b] ed timely.
5. Tunnel excav[c] ction should be smooth, and attention[c] e paid to rockburst.
6. The excavation span at the intersection of the investigation [d] nd the turning adit is large，and a[d] should be paid to timely support to ensure safety.
7. The excavation and support types of the tunnel inlet and tunn[e] can be adjusted by the designer acc[e] the actual situation after the geological conditions are revealed.
8. The end position of the investigation tunnel may be adjusted according to the final position and section size of the powerhouse.
9. The location of the turning adit may be adjusted according to the actual rock conditions.

a) Delete this comment. It is related to construction and not to layout. Such comment should appear in the Method Statement or on construction drawings.
b) Same as under a).
c) Same as under a). Note, there is no rock burst to be expected in the project, so far.
d) Same as under a).
e) Modify this comment: The Designer shall provide alternatives and options in the tunnel support design, so that the support can be adjusted in case geological conditions are varying.

DISCLAIMER

Any approval will not release the Contractor from any of his obligations under the Contract.

Dr. Ulrich Glawe



(Signature)